

**SEMICONDUCTOR DEVICE HAVING A LINER AND METHOD FOR
FORMING**

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Abstract of the Disclosure

An insulating layer (24, 66, 82) is formed over a stack (14) of materials and a semiconductor substrate (12) and an implant is performed through the insulating layer into the semiconductor substrate. In one embodiment, spacers
10 (26) are formed over the insulating layer (24), the insulating layer (24) is etched, and heavily doped regions (36) are formed adjacent the spacers. The spacers (26) are then removed and extension regions (50) and optional halo regions (46) are formed by implanting through the insulating layer (24). In one
15 embodiment, the insulating layer (24) is in contact with the semiconductor substrate (12). In one embodiment, the stack (14) is a gate stack including a gate dielectric (18), a gate electrode (16), and an optional capping layer (22). The insulating layer (24, 66, 82) may include nitrogen, such as silicon nitride and aluminum nitride. In another embodiment, the insulating layer (24, 66, 82) may be hafnium oxide.

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(FIG. 9 to accompany the abstract.)